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FEDERAL COMMUNICATIONS COMMISSION
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Before the

FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Replacement of Part 90 by	)	PR Docket No. 92-235

EXECUTIVE SUMMARY

The opening comments filed in response to the Commission's Notice of Proposed Rulemaking ("Notice" or "NPRM") in PR Docket No. 92-235 clearly demonstrate that this ambitious and daring project requires careful and prudent analysis to avoid creating havoc in one of the most successful radio services regulated by the FCC -- the private land mobile radio services. Although caution is the overwhelming attitude expressed by the industry, there is also a healthy degree of optimism as most participants foresee a future where digital technology provides users with a wide range of new service options while, at the same time, creating new communications capacity through improvements in spectral efficiency.

To its great credit, the land mobile user community has accepted the overall concept of refarming as necessary to the well-being of the service. For example, there is near universal support among the user community that spectral occupancy of land mobile radio transmitters should be reduced to improve efficiency. This support, however, is strongly predicated upon receiving reasonable transition times that not only allow ample opportunity to amortize existing equipment but that also ensure that perfectly useful equipment is not required to be prematurely decommissioned. Also, users predicate their support for refarming on their continued ability to select from a variety of

[redacted]

weighed against the costs imposed upon users, in both financial and operational terms. Through this proceeding, the Commission should take no action that reduces the flexibility of manufacturers to satisfy the diverse communications needs of the user community through the employment of a variety of technologies and modulations. Adopting channel plans that only support very narrowband equipment will reduce that flexibility and will negatively affect the forthcoming digital revolution in the private land mobile services.

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I. OVERVIEW

The FCC's "refarming" proceeding has sparked wide debate over the future regulatory policies and technical standards for one of the most important radio services regulated by the Commission. About 130 parties filed substantive comments to the Commission's proposals for transitioning the private land mobile industry to using radios that occupy less spectrum in order to increase the number of talk paths available in a constant supply of spectrum. What is most striking about the submitted comments is the near unanimous opposition of the land mobile user community to the Commission's transition proposals. On the other hand, there was extensive support for the LMCC "consensus" proposals, particularly Option A which sets forth a transition to true 12.5 kHz land mobile products.

The shear breadth of the opposition alone provides compelling evidence that the proposals found in the Commission's Notice require re-thinking. Indeed, even a partial list of the commenters opposing a forced migration to very narrowband equipment (i.e., 5 kHz or 6.25 kHz equipment) reads like a "who's who" of the private land mobile services:

USER GROUPS: American Petroleum Institute, American Automobile Association, Association of American Railroads, Forestry Conservation Communications Association, Industrial Telecommunications Association, Telephone Maintenance Frequency Advisory Committee, International Bridge, Tunnel and Turnpike Association, International Municipal Signal Association, National Association of Business and Educational Radio, National Association of State Foresters, Utilities Telecommunications Council.

PUBLIC SAFETY ORGANIZATIONS: Associated Public Safety Communications Officers, International Association of Fire Chiefs, National Association of State Emergency Medical Services Directors, County of Los Angeles, New York State Police, Public Safety Communications Council, Texas Department of Public Safety.

EQUIPMENT MANUFACTURERS: Bendix-King, EF Johnson, Ericsson/GE Mobile Communications, Motorola, PowerSpectrum, Telecommunications Industry Association.

Even a cursory review of the comments clearly shows that the real issue of this proceeding is the potential profound effect that the Commission's proposals would impose upon land mobile radio users. The effect would be not only in financial terms, although the comments provide compelling evidence that the Commission's proposals would cost the industry billions of dollars. Users are particularly concerned that the proposed rule changes would disrupt communications and adversely affect their quality of service and range of operations.

What is also clear through the comments, however, is that the user community is not recalcitrant to change. Indeed, there is near universal agreement that the Commission should modify its current technical standards and reduce authorized bandwidths to fit a 12.5 kHz channel for both new and existing land mobile stations. This overwhelming support for increased spectrum efficiency, which will assuredly result in financial impact and operational adjustments for users, is a testimony to their commitment to work with the Commission so that all eligible users may have fair access to the spectrum.

Understanding that change is unavoidable, users are merely asking that they be given enough time to amortize and utilize existing radios before being required to retire such equipment. Equally important, however, users are concerned about committing to the deployment of very narrowband equipment before such equipment has proven itself proficient in the real, congested spectrum world of private land mobile radio. To this end, most users are accepting the need for a reduction in spectrum occupancy to 12.5 kHz channels to be implemented over the next ten years. This reduction would be accomplished primarily

Motorola believes that its opening comments are fully consistent with the near unanimous sentiments of the private land mobile user community. Motorola believes that the FCC should move cautiously forward in this refarming proceeding by keeping the operational needs and financial impact of the user community as the overarching considerations of this proceeding. There is where the public interest lies, not in the efforts of some manufacturers whose sole interest is to gain a market foothold through a government mandate for millions of users to buy unproven and incompatible very narrowband equipment.

II. THE COMMENTS REFLECT WIDE SUPPORT FOR A GRACEFUL MIGRATION TO TRUE 12.5 kHz EQUIPMENT FOR THE VHF HIGH BAND AND THE UHF PRIVATE LAND MOBILE FREQUENCY BANDS

In order to increase spectrum efficiency in the Private Land Mobile Radio bands, the NPRM proposed a two-step migration path for current systems. First, licensees would "migrate" to 12.5 kHz channels, without replacing their equipment, by adjusting transmitter deviation. Second, licensees eventually would be required to convert to 5 kHz or 6.25 kHz channelization in a subsequent equipment changeout. Under this proposal, systems licensed after the effective date of the Rules, however, would be required to begin immediately utilizing 5 kHz or 6.25 kHz bandwidth equipment.

As discussed below, the commenters have overwhelmingly rejected this proposed migration plan as being costly and disruptive to existing operations. While the industry supports

the aim of increasing spectrum efficiency, the comments generally favor achieving efficiency goals through Option A of LMCC's Consensus Plan -- transitioning to true 12.5 kHz equipment and deferring evaluation of more radical alternatives until substantive data exists on the performance of very narrowband equipment.[1] Users also support the concept of technical flexibility rather than a mandate for very narrowband equipment and believe that the Rules should permit a whole host of technologies particularly intended to meet the growing demand for increased data throughput.

A. The NPRM's Proposed Migration Plan Will Result in Huge Costs, Disrupt Major Communications Operations and Inhibit New Equipment Purchases and System Build-Outs

A successful transition should minimize costs to users, maintain or improve the existing quality of service and range of product offerings, support backward and forward compatibility, and not disrupt communications capabilities. Unfortunately, as the industry has documented, the migration plan proposed in the

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[1] See, e.g., Comments of the American Petroleum Institute ("API") at 21-22; Comments of the Associated Public Safety Communications Officers, Illinois Chapter ("APCO-Illinois") at 4; Comments of Bell Atlantic Personal Communications, Inc. ("Bell Atlantic") at 2; Comments of the State of California ("California") at 11; Comments of the California Public Safety Radio Organization ("APCO-California") at 4; Comments of Consolidated Rail ("Conrail") at 7-8; Comments of the Industrial Telecommunications Association, Inc., Council of Independent Communication Suppliers and Telephone Maintenance Frequency Advisory Committee ("ITA et al.") at 13-14; Comments of the International Association of Chiefs of Police ("IACP") at 2; Comments of the National Association of State Foresters ("NASF") at 2; Comments of the Public Safety Communications Council at 2; Comments of the City of Sacramento ("Sacramento") at 3; Comments of the City of San Jose ("San Jose") at 2; Comments of the Union Pacific Railroad Company and the Missouri Pacific Railroad Company ("Union Pacific") at 6.

Notice does not live up to these goals. More specifically, the NPRM perpetuates a mistaken notion from the original inquiry that the transition to 12.5 kHz channels can be accomplished through a simple screwdriver adjustment. As discussed below, the transition to 12.5 kHz channels "w[ill] entail considerably more effort (and finances) than . . . the FCC has suggested,"[2] implying the need to reconsider fundamental aspects of the NPRM's proposed plan.

The comments provide clear proof that the Commission's proposed transition plan will be far more complex and costly than ever imagined. Indeed, a number of users provide sobering estimates of the necessary costs:

- The County of Los Angeles indicates that complying with the FCC's proposed adjustments will require it to expend over $93 million for the Fire Department and Sheriff's Department.[3]

- The City of Lenexa, Kansas, describing its operations as a "small suburban police department," estimates that costs to adjust transmitter deviations for its transceivers citywide "could exceed $10,000," and would result in a "range reduction from 15-30%."[4]

- Curry County, Oregon, a "small rural coastal county . . . with a population of 20,000," estimates that "[t]he narrowband restriction alone would cost the Road and Sheriff Departments $200,000.00."[5]

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[2] Comments of the Coastal Corporation ("Coastal") at 8. See also Comments of the American Automobile Association, Inc. ("AAA") at 29-31; Comments of the Associated Public Safety Communications Officers ("APCO") at 12; Comments of the Town of Avon Fire Department at 1; Comments of the National Association of Business and Educational Radio, Inc. ("NABER") at 4.

[3] Comments of the County of Los Angeles, California ("Los Angeles County") at 4-5.

[4] Comments of the City of Lenexa, Kansas Police Department at 2-3.

[5] Comments of Curry County, Oregon, at 1.

- The Saratoga Volunteer Fire Department, serving Saratoga, Wyoming, estimates that the cost of an equipment change out could be $50,000, "not counting any repeaters or repeater sites that [the Department] might be forced to acquire."[6]

As a result, a number of licensees have requested federal funding assistance to comply with anticipated refarming obligations.[7]

In addition, the comments accurately observe that reducing transmitter deviation would have little effect on spectrum efficiency without a corresponding modification to land mobile receivers.[8] In prior channel plits, "the selectivity of receivers could easily be reduced by replacing the second intermediate frequency (I.F.) filter with a more selective unit," a process that was "simple and quick, normally requiring minimal if any adjustment" but "[t]he selectivity of today's receivers is distributed throughout several components of the first (and often only) I.F. section," and therefore "[i]t would be difficult, costly, and time consuming to further reduce the bandwidth of that circuitry."[9]

The commenters discuss other difficulties in transitioning existing equipment to more narrowband operation. For example, one commenter explains that the reduction in transmitter

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[6] Comments of the Saratoga Volunteer Fire Department at 1.

[7] See, e.g., Comments of Adams County Communications Center, Inc. ("Adams County") at 1-2; Arkansas Department of Health at 1; City of Walnut Creek at 1.

[8] See, e.g., Comments of Bendix/King Radio Corporation ("Bendix/King") at 2; Comments of the Telecommunications Industry Association ("TIA") at 7.

[9] Comments of the Virginia Department of Health ("Virginia") at 12. See also API at 20.

deviation could have a deleterious effect on subaudible squelch signalling systems:

> [Subaudible squelch signalling systems] presently depend on a transmitted deviation of between ±750 Hz and ±1,000 Hz for reliable detection. That deviation is not adjustable in many transmitters, and will result in the tone's contribution to the composite modulating signal increasing to be between 25% and 33% of the maximum deviation. If the deviation is reduced (in those transmitters which have the capability) by a proportionate amount to between ±450 Hz and ±600 Hz, operation will likely become erratic, especially with noisy signals, and some receivers will "chop" or fail to unsquelch on weaker signals.[10]

TIA also notes that reducing transmitter deviation "does not improve transmitter stability to that of a true 12.5 kHz unit," and that "[s]ystem range will be reduced because reduced transmitter deviation (e.g., 2.0 kHz or 2.5 kHz) will result in a decreased receiver signal-to-noise ratio."[11]

Under the circumstances, Motorola concurs with the position that "[t]he Commission should . . . treat the conversion to 12.5 kHz bandwidth as an equipment replacement step, rather than the simple 'screwdriver adjustment' previously envisioned by preliminary comments."[12] With costs as high as indicated in the comments, it is critical to allow individual licensees -- many of

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[10] Virginia at 12; see also Coastal at 9 (noting "[r]educed deviation will remove approximately 50% of the tone coded squelch decoder margin above the threshold of detection" and "[t]his will lead to system failure"); Comments of the East Randolph Fire Department at 1; Comments of the Otto Fire Department at 1; Comments of the Salamanca Fire Department at 1.

[11] TIA at 7. See also Comments of SEA, Inc. ("SEA") at 15-16.

[12] Comments of the Alarm Industry Communications Committee ("AICC") at 5-6. See also AAA at 29-31; Bell Atlantic at 2, Appendix A; Bendix/King at 2; Comments of the California State Automobile Association ("AAA-California") at 4; Comments of the Centralina Council of Governments ("Centralina") at 2.

whom are subject to funding availability constraints[13] -- to

amortize their existing investment over a standard equipment life

quality of the service and expand the applications using private land mobile radio. Manufacturers, frequency coordinators, and users have documented that a transition to 5 kHz or 6.25 kHz channels may, in fact, be contrary to the Commission's goal of promoting the most efficient use of the Private Land Mobile Radio bands. As discussed below, 12.5 kHz channelization offers similar prospects for efficiency as VNB while remaining technology-neutral and allowing the development of services and applications that would be precluded under strict VNB channelization.

The comments show persuasively that the proposal to migrate to 5 kHz and 6.25 kHz channelization inadvisably favors VNB technology to the exclusion of other potentially more efficient techniques. As APCO notes, "[t]here must be an opportunity for the development of all types of communications technologies, including, but not limited to, FDMA (both analog and digital), digital technologies such as TDMA, and narrowband technologies (both analog and digital)."[15] In this case, however, the Commission is "pre-supposing a solution to the narrow-band problem that eliminates [the use of competitive technologies]."[16] In particular, to deploy alternatives to very narrowband technologies, licensees will have to secure contiguous

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[15] APCO at 10.

[16] California at 5.

channels.[17] In the real world, however, securing contiguous channels is an unreliable process at best given the heavy shared use of the private land mobile frequency bands. In addition, the proposed rules actually penalize the use of alternatives to VNB by requiring users employing nonstandard bandwidths to exceed VNB efficiency standards by 25% in order to obtain "early adopter" benefits.[18] This exclusion of wideband techniques must ultimately be viewed as detrimental to the goal of spectrum efficiency.

Furthermore, while it is true that VNB channelization will technically create "more" channels, commenters have observed that spectrum efficiency is more than counting channels.[19] In data applications, for example, throughput is balanced against time of transmission and thus wider bandwidth systems can transfer data much more quickly and efficiently than very narrowband systems. As further explained in Appendix A, 5 kHz channels are actually less efficient in terms of throughput efficiency than wider bandwidth channels.[20]

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[17] See, e.g., Bendix/King at 4; Coastal at 10; Ericsson at 18 n.21; NABER at 29; New York at 5; TIA at 14; Comments of Weyerhaeuser Company ("Weyerhaeuser") at 1.

[18] Proposed Rule § 88.245(c). See also Ericsson at 14-15.

[19] See, e.g., Bendix/King at 2; Ericsson at 12-15; NABER at 5.

[20] See Appendix A which responds to SEA's mistaken projections on data throughput improvements for 5 kHz channels vis à vis 25 kHz channels. SEA at 9.

Moreover, commenters favor LMCC's Option A because, unlike a 5 kHz or 6.25 kHz VNB channelization, 12.5 kHz channelization is technology-neutral.[21] Under a 12.5 kHz channel plan, licensees would have the option of how they increase spectrum efficiency on their channels, including using VNB. This avoids forcing licensees into an approach that, as discussed below, may not adequately satisfy their communications needs.[22]

C. The Majority of Users and Commenters Recognize That a Transition to True 12.5 kHz Equipment Will Better Satisfy the Communications Needs of Users

In addition to being a technology-neutral alternative, Option A of LMCC's Consensus Plan is preferable because a 12.5 kHz bandwidth is critical for a number of emerging PLMR radio applications. LMCC's Option A, for example, is compatible with APCO's Project 25 and channel usage by federal law enforcement agencies both of whom have decided upon a 12.5 kHz FDMA channel plan. Furthermore, 12.5 kHz channelization is superior for a

A broad cross-section of commenters, including non-public safety commenters,[23] support LMCC's Option A channelization because 12.5 kHz equipment satisfies the needs of users as defined in APCO's Project 25.[24] Project 25 is a joint effort involving APCO, the National Association of State Telecommunications Directors, Federal Government Agencies, TIA, and every major equipment manufacturer to provide specifications as to access method, modulation, data rate, trunking and vocoders for digital public safety radio equipment. The private land mobile industry has invested millions of dollars over the past few years to formulate standards and equipment for digital technology, which is only now coming to fruition. Importantly, it is also anticipated that these standards will be extended to the larger private land mobile community generally.

As noted by APCO, however, many commenters "are concerned that the FCC's proposals in this proceeding would undermine the Project 25 standard and its goal of creating competitive markets for interoperable public safety radio equipment."[25] In particular, the VNB channelization proposed in the NPRM would

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[23] ITA et al. at 11-12 n.10; Comments of the Utilities Telecommunication Council ("UTC") at 31.

[24] See, e.g., Comments of the Associated Public Safety Communications Officers, Arizona Chapter ("APCO-Arizona") at 17; APCO-California at 5; Los Angeles County at 5; New York at 6; Comments of the County of Orange, California ("Orange County") at 5-6; San Jose at 2; Suffolk County Police

thwart Project 25's efforts to smoothly transition to a 12.5 kHz bandwidth. As explained by the State of Colorado:

> [A] Project 25 radio can operate on both 25 kHz analog channels and 12.5 kHz digital channels. Many of the major equipment vendors will have forward/backward compatible equipment available in the very near future. This will allow users to purchase new radios and replace existing radios with the ability to migrate to narrow band technology over the next several years. This process will have the least financial impact on the users [and] allow for a planned migration to the new spectrum efficient standards.[26]

The 12.5 kHz FDMA bandwidth employed in the Project 25 standard, importantly, also allows compatibility with Federal Government

proposed reduction in channel spacing is expected to exacerbate interference problems."[33]

First, commenters have noted that increasing the number of transmitters in a given amount of spectrum will increase the potential intermodulation interference.[34] For example, TIA observes:

> [B]y changing the channelization from 25 kHz to 5 kHz increments, the number of channels increase by a factor of 5. But, the number of potential intermodulation interferences per megahertz is increased by a factor of 23.4 for two signal, third order intermodulation, and by a factor of 133 for 3 signal, third order intermodulation interference signals.[35]

Even worse, as APCO notes, as these intermodulation problems increase, the technical solutions available to combat intermodulation interference decrease in utility: "[c]ombining devices, cavities and crystal filters are essentially wide band and will not be effective in providing adequate protection at the proposed channel spacing."[36]

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[33] Orange County at 6.

[34] See, e.g., APCO at 27-29 (stating "as channels are split and the number of frequencies becomes greater these intermodulation and desensitization problems will increase--not in a linear fashion, but exponentially!"); California at 14-15; AAA-California at 4; Orange County at 6 (stating "[i]ntermodulation interference is another concern. It is noted that possibilities for intermodulation increases exponentially with the number of frequencies in use. Thus, with a threefold increase in the number of channels, it is expected that there will be at least a ninefold increase in intermod potential.").

[35] TIA at 13.

[36] APCO at 28. In addition to intermodulation interference, Motorola is also concerned about the harmful effects of impulse noise from man-made and environmental sources upon very narrowband receivers. Contrary to the claims of Securicor (Comments of Securicor PMR Systems Ltd ("Securicor"), Appendix 1 at 5), it has been Motorola's experience that reducing the bandwidth of land mobile receivers exacerbates the interference effects of impulse sources such

Second, commenters indicate that receiver desensitization may become a significant factor if VNB technology is deployed widely throughout the congested PLMR bands. As Orange County correctly notes:

> Desensitization occurs when there is a transmitter in the immediate proximity to a receiver, and is inversely proportional to its frequency separation. Such interference will be especially prevalent when in a transition period requiring the use of reduced deviation and standard receivers (those used with 5 kHz deviation).[37]

Finally, manufacturers of VNB equipment note the difficulties of sharing spectrum with wider bandwidth systems which will surely be the case during any transition period. SEA, for example, notes that in a shared radio environment "there is an operational requirement to utilize interoperable equipment so a clear channel can be monitored."[38] SEA's experience foretells a logistical nightmare that the private land mobile community can expect if the Commission intends to mandate the use of very narrowband equipment alongside wider equipment.

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as car ignitions. Motorola has yet to see any verifiable documentation that this problem has been addressed by any of the manufacturers of very narrowband equipment.

[37] Orange County at 6.

[38] SEA at 3.

For example, SEA notes that the Commission's proposals will not necessarily create significant numbers of "new" narrowband channels operating between regularly assignable frequencies:

> the existence of reduced-deviation transmitters (old or new) would limit the ability to integrate new technology licensees on adjacent channels (See Figure B-3), as it appears that the nearest adjacent narrowband channel would need to be spaced 15 kHz away. Were this the case, only one narrowband channel could be placed between two reduced deviation FM stations. . . .[39]

Thus, SEA correctly points out the difficulty of co-mingling very narrowband equipment with wider bandwidth devices. Accordingly, the NPRM proposal could be far less efficient than the Commission apparently assumed.

The existence of such grave and debilitating potential technical problems highlights the importance of the ongoing activities in the 220-222 MHz band, which was intended to be a crucible for testing VNB technology.[40] As Ericsson notes:

> [T]he Commission's 1991 decision authorizing a 5 kHz VNB technology for the 220-222 MHz band was supposed to be the testing ground for this unproven technology. However, since no commercial systems exist in that band, one can assume that VNB technology is still unproven--especially for use in an already crowded band.[41]

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[39] SEA at 16.

[40] Union Pacific at 6 (stating "Union Pacific strongly believes that the Commission should reevaluate the need for the very narrow band channel plans in 1999 by means of a [FNPRM]. Also, at that time the utilization of the 220 MHz band could be used as a measurement device to determine the additional amount of spectrum which would be required to satisfy the smaller systems requiring only voice communications in the current PLMR bands.")

[41] Ericsson at ii. See also Comments of the American Mobile Radio Association, Inc. ("AMRA") at 4.

Noting that "systems in [the 220-222 MHz] band are languishing

it would be prudent policy for the Commission to defer consideration of mandating VNB use.[46]

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For these reasons, Motorola urges the Commission to adopt 12.5 kHz channeling plans for the 150-174 MHz and 421-512 MHz frequency bands. Motorola's plan provides a graceful transition to true 12.5 kHz equipment for all users in the VHF and UHF bands. Based on 12.5 kHz assignments, the proposal would minimize costs and disruptions to existing users.

III. COMMENTERS ARE NEARLY UNIFIED IN THEIR OPPOSITION TO THE FCC'S PROPOSED HEIGHT AND POWER LIMITATIONS

Even a casual perusal of the comments filed in this proceeding cannot fail to highlight the broad variety of private